



## CLAIMS

I CLAIM:

3. An apparatus for the mixing of at least one fluid stream having various  
5 spatial positions and properties and creating streamwise vortices comprising:  
  
at least one chamber having a proximal end, a distal end, a corresponding  
actuator for forcing the mixing of at least one fluid stream, an inlet means  
for receiving at least one fluid stream at said proximal end and a divider  
10 means for separating at least one fluid stream mounted within at least one  
chamber at said proximal end.
4. An apparatus for mixing as claimed in claim 3 wherein said inlet means is at  
least one inlet port.
- 15 5. An apparatus for mixing as claimed in claim 4 wherein said divider means is  
at least one splitter plate having a trailing edge.
6. An apparatus for mixing as claimed in claim 5 wherein at least one splitter  
20 plate extends from said proximal end of at least one chamber to a point  
towards said distal end of at least one chamber allowing for the separation of  
at least one fluid stream until mixing beyond said trailing edge of at least one  
splitter plate.
- 25 7. An apparatus for mixing as claimed in claim 3 wherein at least one splitter  
plate may be straight or nonhomogeneous-formed.

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8. An apparatus for mixing as claimed in claim 3 wherein said corresponding actuator for forcing the mixing is a narrow frequency band independent on said fluid's convection velocity.
- 5 9. An apparatus for mixing as claimed in claim 8 wherein said narrow frequency band is generated by a means selected from the group consisting of a forced flap in said trailing edge of at least one splitter plate, a forced membrane; a piston pump and a periodic valve upstream of said trailing edge of at least one splitter plate.
- 10 10. An apparatus for mixing as claimed in claim 8 further comprising a periodic velocity component generated from said corresponding actuator.
11. An apparatus for the mixing of at least one fluid stream having various  
15 spatial positions and properties and creating streamwise vortices comprising:  
at least one chamber having a proximal end, a distal end and a corresponding actuator for forcing at least one fluid stream.
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- 20 12. A process for the mixing of at least one fluid stream and creating streamwise vortices comprising:
- introducing at least one fluid stream into at least one chamber having a proximal end, a distal end through an inlet means for receiving at least one  
25 fluid stream at said proximal end of at least one chamber;
- separating at least one fluid stream within at least one chamber by a divider means mounted at said proximal end of at least one chamber;
- applying a corresponding actuator for forcing the mixing of said at least one fluid stream downstream of said divider means.

13. A process for the mixing of at least one fluid stream as claimed in claim 12 wherein said divider means is at least one splitter plate having a trailing edge wherein at least one fluid stream mixes downstream of said trailing edge of at least one splitter plate creating said streamwise vortices.
14. A process for mixing of at least one fluid stream as claimed in claim 13 wherein at least one splitter plate extends from said proximal end of at least one chamber to a point towards said distal end of at least one chamber for separating at least one fluid stream until said trailing edge of at least one splitter plate and generating vortices for mixing at least one fluid stream.
15. A process for mixing of at least one fluid stream as claimed in claim 14 further comprising matching at least one chamber to said corresponding actuator wherein said corresponding actuator is a narrow frequency band independent on said fluid convection velocity.
16. A process for mixing of at least one fluid stream as claimed in claim 15 wherein said narrow frequency band is generated by a means selected from the group consisting of a forced flap in said trailing edge of at least one splitter plate, a forced membrane, a piston pump and a periodic valve upstream of said trailing edge of at least one splitter plate for forcing the mixing of at least one fluid stream.
17. A process for mixing of at least one fluid stream as claimed in claim 16 further comprising producing a periodic velocity component generated from said corresponding actuator.
18. A process for mixing at least one fluid stream as claimed in claim 12 wherein said mixing process reduces acoustic noise.

19. A process for mixing at least one fluid stream as claimed in claim 12 wherein said mixing process improves chemical reactor (e.g. combustor) instability.
- 5 20. A process for mixing of at least one fluid stream as claimed in claim 12 wherein said mixing process improves flow separation control.
- 10 21. A process for mixing of at least one fluid stream as claimed in claim 12 wherein said two or more fluid streams have sufficient high initial velocity ratios of  $(U1-U2)/(U1+U2)$  and  $(U1+U2)/2$  for no external forcing.
- 15 22. A process for mixing at least one fluid stream as claimed in claim 12 wherein said mixing process enhances the heat transfer rate for heat exchangers.